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NOTE on No. 78, Algebra. Mr. Boorman misapprehends the "real point" of my comment. I will endeavor to make my meaning plain.

Given $x^2 + xy = 10$ and $y^2 + xy = 15$ to find the values of x and y . Adding these two equations and taking the square root, we have $x + y = \pm 5$. Dividing the first equation by this, we have $x = \pm 2$, and in the same manner, $y = \pm 3$.

I have supposed that it is *settled* that an equation of the second degree has two roots and *no more*, especially when the equation can be solved by an equation of that degree; and that when an equation of a higher degree, which has more than two roots, is needlessly used in the solution, still the number of roots of the original equation is not thereby increased, and that all, save two, of the roots of the higher equation are not roots of the original equation.

Now, Mr. Boorman, in his solution, page 43 of last volume, by transposing xy to the other side of the original equations and then multiplying the two equations together, obtains an equation of the *fourth* degree. So I said in my Note (and say now) that his solution seems to me to involve the following course of reasoning: If $x^2 = 36 \dots (1)$, then $x^4 = 1296 \dots (2)$, and as equation (2) has four roots, therefore equation (1) has four roots: a manifest error as it seems to me.

I did not "mistake him to mean" that the roots of $x^4 = 16$, are ± 2 and ∓ 2 ; but in his solution of No. 78, he says there are eight roots, viz.: $x = \mp 2$ and $y = \mp 3$, and $x = \pm 2$ and $y = \pm 3$. But I said that ± 2 and ∓ 2 , *taken by themselves*, are precisely the same, and therefore that his *eight* roots are really only *four*, i. e. two pairs, two values of x and two values of y , precisely as are obtained without transforming the original equations of the second degree into a biquadrate equation.

JOSIAH H. DRUMMOND.

GEOMETRY.

106. Proposed by B. F. FINKEL, A. M., M. Sc., Professor of Mathematics and Physics, Drury College, Springfield, Mo.

Sind A, B, C, D vier harmonische Punkte und beschreibt man über dem Durchmesser AC einen Kreis, von welchem S ein beliebiger Punkt ist, so wird derjenige Kreisbogen, welcher innerhalb des Winkels BSD liegt, entweder von A oder von C halbiert. [*Reye's Geometrie der Lage*, page 191.]

I. Solution by C. HORNING, A. M., Professor of Mathematics, Heidelberg University, Tiffin, Ohio.

Sind A, B, C, D vier harmonische Punkte und S ein beliebigen Punkt auf dem Kreis ASC , so sind SA, SB, SC , und SD vier harmonische Strahlen, denn vier harmonische Punkte werden aus jedem Punkte (S) durch vier harmonische Strahlen projicirt.

Weil aber die Strahle SC auf der Strahle SA senkrecht steht, so halbiert sie den Winkel zwischen den anderen beiden, Strahlen SB und SD , und folglich den Kreisbogen zwischen denselben, nach dem Satz: "Wenn von vier harmonischen Strahlen zwei getrennte auf einander senkrecht stehen so halbiren sie die Winkel zwischen den anderen beiden Strahlen."

II. Solution by G. B. M. ZERR, A. M., Ph. D., Professor of Mathematics and Science, Chester High School, Chester, Pa.

Let A, B, C, D be the given points.

Join AS, BS, CE, DS . Then $AB:BC=AD:DC$, or $AB:AD=BC:DC$.

$\therefore \triangle ASB:\triangle BSC=\triangle ASD:\triangle CSD$.

$\therefore AS.BS\sin ASB:BS.CS\sin BSC=AS.DS\sin ASD:CS.DS\sin DSC$.

$\therefore \frac{\sin ASB}{\sin BSC} = \frac{\sin ASD}{\sin DSC}$.

But $\sin ASB=\sin(\frac{1}{2}\pi-BSC)=\cos BSC$.

$\sin ASD=\sin(\frac{1}{2}\pi+DSC)=\cos DSC$.

$\therefore \cot BSC=\cot DSC$.

$\therefore \angle BSC=\angle DSC$.

$\therefore C$ bisects arc FCE . Similarly A bisects arc $EASF$.

CALCULUS.

80. Proposed by B. F. FINKEL, A.M., M.Sc., Professor of Mathematics and Physics, Drury College, Springfield, Mo.

A vessel is anchored in three fathoms of water, and the cable passes over a sheave in the bowsprit, which is six feet above the water. If the cable is hauled in at the rate of one foot a second, how fast is the vessel moving through the water when there is five fathoms of cable out? What is the acceleration of the vessel's velocity? [From *Byerly's Problems in Differential Calculus*.] Ans.—(a) 5-6 feet per second; (b) 12-121 feet per second. Are these results correct?

I. Solution by C. HORNING, A. M., Professor of Mathematics, Heidelberg University, Tiffin, Ohio

Let x =the horizontal distance from sheave to anchor, and y =the length of cable out, both in feet.

Then $x=(y^2-576)^{\frac{1}{2}}$. Differentiating and making $y=30$ and $dy=-1$, we find $dx=-\frac{5}{3}$; that is, x diminishes at the rate of $\frac{5}{3}$ ft. per second, or the ship moves at the same rate. Differentiating again and making the same substitutions we get $d^2x=-\frac{8}{81}$, that is, the vessel's velocity is increasing at the rate $\frac{8}{81}$ ft. per second.

Accordingly the results given as answers to the problem are not correct. It is evident without a solution that the vessel's velocity is always *greater* than the rate at which the cable is hauled in.

II. Solution by ELMER SCHUYLER, High Bridge, N. J.

If I understand the problem, it is (1) $y^2=x^2+24^2$.

We want to find $dx/dt=v$, and $d^2x/dt^2=\alpha$. (2) $y/t=1$.

$\therefore y=t$; $dy=dt$.

$dy/dt=1$, i. e. rate is constant and has no acceleration.

(3) $2x \frac{dx}{dt} = 2y \frac{dy}{dt}$.